Qualitative Air Toxics Impact Analysis Protocol

Detroit Intermodal Freight Terminal

Environmental Impact Statement

1.0 Introduction

The Detroit Intermodal Freight Terminal project (DIFT) is proposed to consist of the enhanced development of terminals operated by the four Class I Railroads[1] that serve Michigan to provide improved intermodal service to business, industry and the military. There are four intermodal terminals to be included in the DIFT EIS: the Livernois-Junction Yard in Southwest Detroit (operated by CSX and Norfolk Southern); Canadian Pacific's Expressway terminal behind the Michigan Central Depot just north of Bagley; the CP/Oak Terminal located in the northwest corner of the intersection of I-96 and the Southfield Freeway; and, the Canadian National/Moterm Terminal on the Wayne County/Oakland County border north of 8 Mile Road between I-75 and Woodward Avenue.

The Michigan Department of Transportation (MDOT) has studied the intermodal freight situation over a number of years. MDOT has decided to proceed with preparation of an Environmental Impact Statement (EIS) to evaluate alternatives to improve these intermodal freight movements and their related impacts.

Under the National Environmental Policy Act (NEPA), federal agencies are required to identify and describe the potential impacts to the human and natural environments as a result of their action(s), including those to air quality. Air toxics and $PM_{2.5}$ have been recognized as of particular interest in the air quality impact analysis for the DIFT because of the potential concentrated activities of heavy-duty diesel trucks, locomotives, and container-handling equipment, and because of fugitive dust emissions at the terminals. There are no established regulatory standards specifying harmful concentration levels, attainment area designations, or analysis protocol for evaluating air toxics or $PM_{2.5}$ impacts for transportation projects. Additionally, EPA has not yet designated attainment/nonattainment areas for these pollutants. Given these unique regulatory and policy circumstances, FHWA has acknowledged the need to address air toxics and $PM_{2.5}$ for the DIFT project through the protocol described here.

The goal of the analysis is to provide decision-makers with information to view the relative impacts of each alternative and to provide such information to the public. The results of the analysis will not provide a means for a pass/fail comparison to standards, because no standards have been established for these pollutants and because the analysis methods, including the use of surrogates and models that have not yet been adopted for regulatory use, are too tentative to allow for strict comparisons.

The air toxics and $PM_{2.5}$ qualitative analysis approach described in this document for the DIFT addresses health risks, the limitations of the current state of the science to quantify such risks, national downward trends resulting from vehicle emission controls, a surrogate approach for viewing relative emissions among the alternatives, and potential benefits from selected mitigation measures. This approach is consistent with the CEQ NEPA regulations (40 CFR 1502.22 and 1502.24) that hold agencies accountable for the scientific integrity of sources and procedures relied upon for decision-making. Under this regulation, when the means to obtain data are unavailable (in this case, the state of the science for air toxics and $PM_{2.5}$), agencies must acknowledge such limitations, discuss the relevance to impacts on the human environment, summarize existing credible scientific evidence, and make reasoned judgments of impacts based on theoretical approaches.

[1] A Class I Railroad has at least $250 million in revenue per year.

2.0 Health Risks

Some health agencies and research institutions have reported on the health effects of air toxics. Exposure to toxic air pollutants at sufficient concentrations and durations may result in an increased chance of experiencing serious health effects. These health effects appear to include damage to the immune system, as well as neurological, reproductive (e.g., reduced fertility), developmental, respiratory and other health problems. The health effects from some air toxics may appear following a short period of exposure, while others may only appear after long-term exposure. “For these (and other) reasons, it is frequently very difficult to conclusively associate environmental levels and potentially linked public health impacts” (MDEQ, 2003). Additionally, supporting documents for the health assessment of diesel engine exhaust used in the development of EPA’s nonroad rules acknowledges that “the assessment's health hazard conclusions are based on exposure to exhaust from diesel engines built prior to the mid-1990s”….and ”as new diesel engines with cleaner exhaust emissions replace existing engines, the applicability of the conclusions in this Health Assessment Document will need to be re-evaluated” (U.S. EPA, 2002).

3.0 Limitations of Current State of the Practice

In addition to the uncertainty associated with the health risks of air toxics and $PM_{2.5}$, issues related to quantifying impacts and the lack of standards have been raised. Unlike smokestack testing for point sources, it is not feasible to directly measure mobile source emissions, given the number of tailpipes that constitute the inventory. Modeling approaches, however, can provide a tool for assessing project impacts (before a facility is constructed), and for comparing the relative merits of various control strategies or project alternatives. Unfortunately, although transportation and air quality models are constantly being tested and improved, credible models to calculate $PM_{2.5}$ and air toxics emissions and dispersions have not yet been adopted for regulatory use. And, while the U.S. EPA has hosted on its Web site the air quality emission factor model known as MOBILE 6.2, EPA has not officially approved its use for air toxics or $PM_{2.5}$. During meetings to discuss the air toxics analysis for the DIFT, FHWA representatives expressed the following additional concerns with MOBILE 6.2: the use of outdated engine tests data; the lack of sensitivity to speed; PM emissions factors based on the old PART5 model that was never approved for use; and, failure of the model to account for re-entrained dust. Consequently, a perplexing situation exists in which it is not realistic to quantify air toxics and $PM_{2.5}$ and, even if it were, there are no established standards for comparison.

Other limitations that must be acknowledged at the outset are that: 1) the NONROAD Model proposed to be used in this analysis to obtain emission factors for container-handling equipment has not been officially approved by EPA and does not include the benefits of the proposed non-road diesel rule; and, 2) the U.S. EPA has not designated areas for $PM_{2.5}$ or air toxics attainment/nonattainment.

These limitations preclude a quantitative pass/fail conformity-type analysis for air toxics and $PM_{2.5}$ at this time. Nevertheless, in order to gain some insights into the relative differences among the alternatives with regard to air toxics and $PM_{2.5,}$ this document proposes estimating emissions using a surrogate approach. The rationale for a substitute approach under such circumstances is consistent with the requirements of 40 CFR 1502.22 and 1502.24. See Section 5 for details.

4.0 National Trends and Continuing National Research

The DIFT air quality report will include a discussion of air quality tends, including air toxics and $PM_{2.5}$. The purpose of such a discussion is to provide an historical context of air pollution in the U.S. and how conditions have improved with the passage of air pollution laws and improved technology.

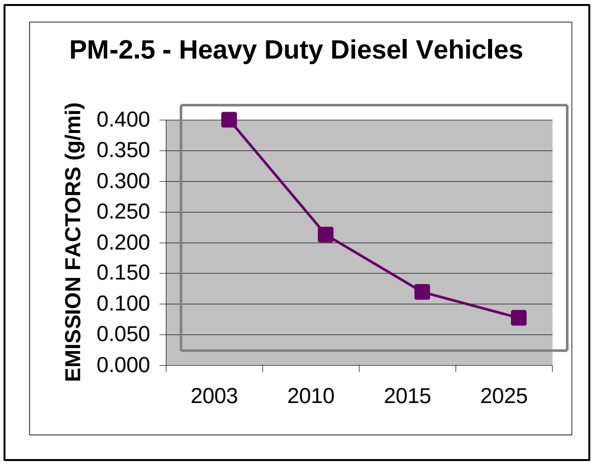
Historically, EPA's efforts have centered on industrial and area sources of air toxics. As of April 2002, EPA issued 53 standards for 89 different types of major industrial sources of air toxics, such as chemical plants, oil refineries, aerospace manufacturers and steel mills. The Agency also issued regulations for eight categories of smaller sources of air toxics, such as dry cleaners. Together, these standards are projected to reduce annual emissions of air toxics by over 1.5 million tons from 1990 levels, when fully implemented.

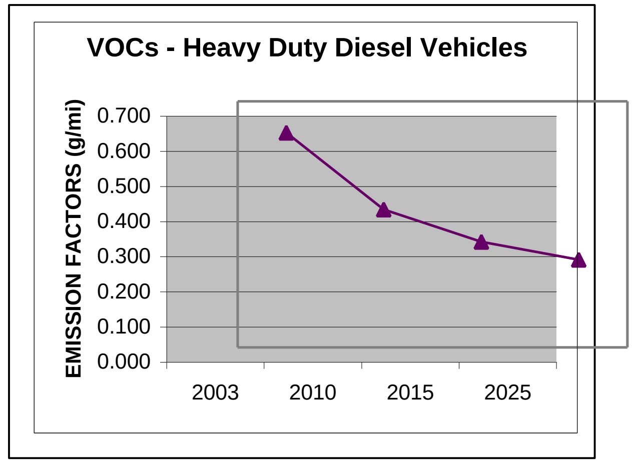
Data from the 1996 National Toxics Inventory indicate that mobile sources account for approximately 50 percent of air toxics emissions (U.S. EPA, 2000). To address these emissions, EPA has issued a suite of motor vehicle and fuels regulations, including tailpipe emission standards for cars, SUVs, mini-vans, pickup trucks and heavy trucks and buses; standards for cleaner-burning gasoline; a national low-emission vehicle program; and, standards for low-sulfur gasoline and diesel fuel. By the year 2020, these requirements are expected to reduce emissions of a number of air toxics (benzene, formaldehyde, acetaldehyde and 1,3-butadiene) from highway motor vehicles by about 75 percent and diesel particulate matter by over 90 percent from 1990 levels (U.S. EPA, 2000).

In addition, the Agency is developing a regulation to control emissions from diesel-powered non-road engines. Finally, EPA provides assistance in identifying and implementing voluntary programs, such as diesel retrofits, to achieve additional reductions.

Research is underway by EPA and others at a national level to evaluate ambient air toxics in order to understand their spatial variability in urban settings; evaluate data from mobile-source oriented monitors; and, provide data for the National Air Toxics Network maintained by EPA. One of the programs sponsored by EPA is the Detroit Air Toxics Pilot Project, which began collecting data from monitoring stations in 2001. Data from these programs may ultimately be used to develop standards to address health or environmental risks from air toxics.

As previously noted, the methodology for estimating air toxics emissions from mobile sources is still being developed. Nevertheless, expected trends in $PM_{2.5}$ and VOC (Volatile Organic Compounds) emission factors offer some important background. Results for preliminary model runs using MOBILE 6.2 and national default inputs are shown below. $PM_{2.5}$ emission rates from heavy-duty diesel vehicles after about 2010 are expected to be substantially lower than present emission rates. A similar trend is apparent in VOC emission rates. These trends in emission rates are primarily a function of low-sulfur fuel requirements.





5.0 Approach for Estimating $PM_{2.5}$ and Air Toxics Emissions

Considering the limitations of the current state of the science regarding air toxics and $PM_{2.5}$ and the inability to realistically quantify and compare these emissions to established standards, this protocol explores another approach for gaining some insight on the relative levels among the DIFT alternatives.

Diesel exhaust is a complex mixture of inorganic and organic compounds that occur as a blend of gases and particles. The gaseous components include nitrogen oxides, sulfur compounds, and low-molecular-weight hydrocarbons, such as the aldehydes, benzene, 1,3-butadiene, and polynuclear aromatic hydrocarbons. The particle phase of diesel exhaust consists of elemental carbon, adsorbed organic compounds and small amounts of sulfate, nitrate, metals and other trace elements. Diesel particulate matter (PM) has been estimated to comprise about 6 percent of the total $PM_{2.5}$ inventory nationwide and more in urban areas, excluding natural and miscellaneous sources (U.S. EPA, 2002).

Compounds of most specific interest for the DIFT project are those found in particulate matter and, to a lesser degree, volatile organic compounds (VOCs), which are also emitted by diesel vehicles. This Protocol involves defining the relative impacts of these toxics by estimating burdens of $PM_{2.5}$ and VOCs. Several of the air toxics that EPA has identified as priority mobile source air toxics (MSATs) constitute a subset of all VOCs. Hence using the MOBILE model to illustrate VOC trends can provide some level of insight into trends for priority air toxics. Also included on EPA's list is diesel particulate matter (DPM) and organic gases. While no precise definition exists regarding the constituents of DPM, there is some level of overlap between DPM and $PM_{2.5}$, so an analysis of $PM_{2.5}$ may provide insights into this type of air toxic compound. Thus, quantification of these emissions, as a whole, may serve as surrogates for air toxics and DPM.

5.1 $PM_{2.5}$

A $PM_{2.5}$ burden summary will be prepared of each alternative for the base year (2003), year of project opening (2015), and design year (2025). The results of this summary may provide insights into the relative impacts of the alternatives. The results of this analysis may also be useful in illustrating to the public the trend in $PM_{2.5}$ emissions resulting from the use of cleaner engines and fuels.

For each terminal, $PM_{2.5}$ emissions will be predicted for on-yard activity (heavy-duty diesel trucks, locomotives, and container-handling equipment) and for activities that occur in the expansion area, which will include truck traffic and industrial activity. This will be done for a common geographic universe per intermodal terminal to be agreed upon by FHWA and MDOT. Truck, locomotive and container-handling activity (i.e., hours of operation, idling times, fuel usage, etc.) will be developed using on-site surveys and count data provided by MDOT and the participating railroads, and published industry information.

The MOBILE 6.2 model will be used to obtain emission factors (in grams/mile) for truck movements. An emission factor for an average speed of 2.5 miles per hour will be used to estimate idling conditions because MOBILE 6.2 does not generate emission factors for vehicle idling.

The emission factors for locomotives will be obtained from EPA's 1997 "Emission Factors for Locomotives" (EPA420-F-97-051). This document includes factors (grams/gallon of fuel usage) for priority pollutants for line-haul and switch locomotives, acknowledging that the latter frequently are older, less serviceable models at the end of their useful life. A load factor will be applied to the emission factor in order to obtain a more realistic emission estimate. The PM emission factor will be adjusted to obtain a $PM_{2.5}$ factor because the technique does not contain a separate factor for $PM_{2.5,}$ which, unavoidably, further limits the robustness of the results.

The most recent version (draft or final) of U.S. EPA's NONROAD Model will be used to obtain emission factors for container-handling equipment.

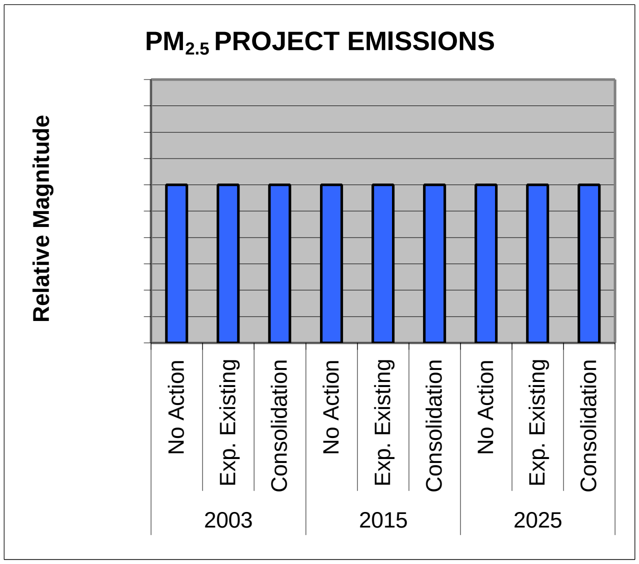
The burden analysis will include estimates of other emission sources located outside the terminal areas, but within the expansion areas. For example, the $PM_{2.5}$ emissions from an industrial facility located within the expansion area, but to be relocated, would be added to the base-year total and subtracted from the future years of the build alternatives because the facility would not continue to operate within the expansion area. The emission estimate for a permitted stationary source, such as an industrial facility, would be obtained from the TRIS database, or MDEQ (the permitting agency).

The burden analysis for $PM_{2.5}$ will consider fugitive dust emissions. Project-related dust emissions are anticipated to be important in this analysis because the build alternatives are expected to reduce PM emissions by covering unpaved roads and exposed soil in terminal areas. Road/soil dust tends to have a lower percentage of $PM_{2.5}$ than diesel particulate matter; however, the sheer size of the unpaved terminal areas (e.g., at the Livernois-Junction Yard) represents a significant part of the total PM emissions (including $PM_{2.5}$) that could be eliminated or minimized by paving these areas. In the case of the Livernois-Junction Yard, analyses may show that $PM_{2.5}$ from road/soil dust to be *more significant* to DIFT neighbors because road/soil emissions are cool and not as buoyant as diesel emissions so they tend to disperse over a more localized area, albeit in higher concentrations. Diesel emissions are hot and buoyant so they tend to rise in the atmosphere and disperse over a wider area in relatively lower concentrations.

EPA's "Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume 1: Stationary Point and Area Sources" (EPA 1995) and its "Supplements" (EPA 2002) will be the source of emission factors for fugitive dust emissions. The approximate acreage of unpaved area on each terminal will be calculated using GIS mapping tools. The estimates will include individual emission estimates for unpaved roads, material stockpiles, and other uses, as appropriate.

The results of the $PM_{2.5}$ burden analysis would be presented in a form that allows a relative comparison to be made between the No Action Alternative and each of the action alternatives, i.e., Expand/Improve Existing Terminal, and Consolidate All Intermodal Activity. An example is shown here.

EXAMPLE PRESENTATION



5.2 VOCs

VOCs (Volatile Organic Compounds) will be used as a surrogate for organic air toxic compounds. In doing so, it is recognized that, in addition to the limitations of this approach cited above, the use of VOCs as a surrogate for organic air toxic compounds does not account for the reactivity of individual air toxics. Aldehydes, for example, tend to react in the atmosphere relatively quickly, removing them from the air toxics category as they are chemically transformed through natural processes. Thus, when a trend in VOC emissions is identified, it may be assumed that this trend will represent a ceiling of organic air toxics.

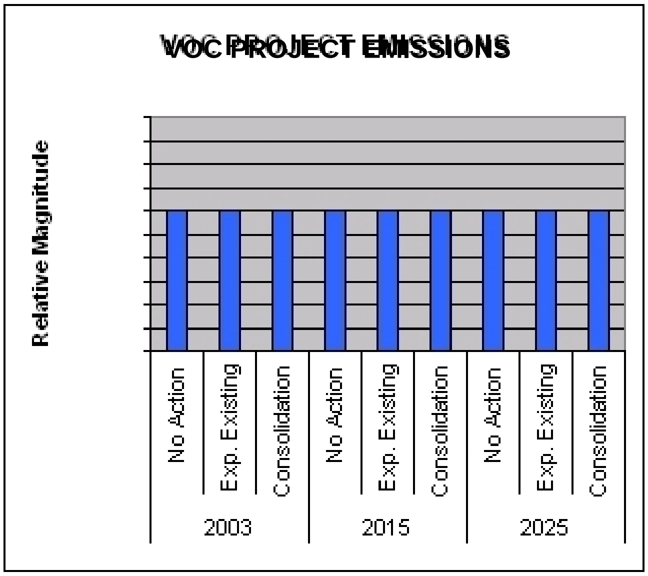
The VOC analysis will be done using the same geographic areas used in the $PM_{2.5}$ analysis. The truck, locomotive and container-handling activities (i.e., hours of operation, idling times, fuel usage, etc.) for on-yard movements and for movements that occur in the expansion area (which include truck traffic and industrial activity) will be combined with MOBILE 6.2 emission factors to obtain an emission burden for each activity. The burden summary will be prepared of each alternative for the base year (2003), year of opening (2015), and design year (2025).

The emission factors for locomotives will be obtained from EPA's 1997 "Emission Factors for Locomotives" (EPA420-F-97-051) adjusted for train load. U.S. EPA's NONROAD Model will be used to obtain emission factors for container-handling equipment.

The burden analysis will include estimates of other VOC emission sources located outside the terminal areas, but within the expansion areas. Example sources are chemical storage tanks, industrial manufacturing facilities, gasoline stations, etc. The emission estimate for a permitted stationary source, such as an industrial facility, will be obtained from the TRIS database, or MDEQ (the permitting agency). Like the $PM_{2.5}$ example cited above, the VOC emissions from other non-DIFT sources located within the expansion area would be added to the base-year total and subtracted from the future-year total for the build alternatives, because those sources that would be relocated would no longer be present in the project area.

The results of the VOC burden analysis would be presented in a form that allows a relative comparison to be made between each of Alternatives 2 and 3 with the No Action Alternative, as shown here.

EXAMPLE PRESENTATION



Technical Report

The DIFT Air Quality Technical Report to be prepared for the DIFT EIS will include results from the above-stated methodology that characterize the communities around each terminal site. The report will show the locations of residential areas, schools, day care facilities, parks, and hospitals relative to the DIFT terminals. The type of activities that would occur at rail yards that could impact these nearby facilities (100 to 300 meters away) will be discussed. An evaluation of the potential health effects on population is beyond the scope of this analysis. Nevertheless, data will be presented on asthma hospitalizations for sensitive age groups (i.e. the very young and/or seniors) by zip code compiled by the Michigan Department of Community Health, recognizing use of such information does not allow conclusions to be drawn about a specific project or alternative.

6.0 Mitigation

The analysis will include a discussion of practical mitigation measures that would be considered to lessen impacts from air toxics. Mitigation includes programs that utilize new technologies and strategies to reduce pollution from heavy-duty vehicles (trucks and locomotives) as well as off-road equipment. Some of the major technologies/strategies that will be evaluated are described below:

- Engine Idling Reduction Programs for trucks and locomotives, such as auxiliary power units for trucks and automatic shut-off devices for idling locomotives
- Retrofit engines with particulate filters and NOx adsorbers
- Use of 2007 certified HD engines
- Use of highway diesel fuel for construction equipment and other off-road vehicles
- Use of 2007-required low sulfur diesel fuel
- Use of electrified truck parking areas
- Use of alternative fuels for handling equipment, e.g. NGV

The railroads that will participate in the DIFT have expressed an interest in mitigation. In fact, CSX Corp. is a Charter Partner in the SmartWay Tranport program, which is voluntary program that incorporates idle reduction, improved logistics management and other strategies to reduce pollution. Another mitigation measure is paving unpaved surfaces to control dust.

It is anticipated that the EIS will contain agreements that mandate specific air toxics mitigation measures, which will be defined as the project advances. Additionally, the railroads have committed to paving the Livernois-Junction Yard under the Expand Existing Terminals and Consolidation alternatives.

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